HEALTHY COASTAL ECOSYSTEMS FOCUS TEAM

EBM IMPACTS

OCTOBER 2009

110 ALASKA: Sea Grant-NOAA research studied the ecological role of marine mammals and their response to a changing environment

Activity Summary: Alaska Sea Grant supported MAP's marine mammal specialist while collaborating on the Gulf Apex Predator-prey project, a NOAA-funded study of the seasonal and interannual variability in prey availability and use by Kodiak's apex marine predators. Results showed that the diets and distribution of Kodiak's endangered marine mammals are diverse and flexible, responding to temporal changes in environmental conditions and local prey availability. Impact Statement: Ecosystem-based marine resource management relies on understanding both the structural components of the system and the functional mechanisms of their interactions. By monitoring the seasonal distribution and abundance of predators and their prey, GAP studies have illuminated how changes in coastal climate and commercial harvests may affect endangered marine mammals and other apex predators in Alaskan waters. As a multi-year study, GAP is developing the time-series needed to explore and anticipate effects of environmental change on primary and secondary production in a coastal marine ecosystem. *[(ebm mod cli end)]*

20 CALIFORNIA: Baseline Studies of Marine Protected Areas

California Sea Grant researchers identified the population structure of cabezon (one of the most economically important fisheries in Central California); they also mapped the movements and home ranges of spiny lobsters and of two key sport fishes, and examined the effects of climate change on fish assemblages. Another group of studies collectively provided a snapshot of key species in rocky intertidal, mid-depth and deep waters off Central California, providing a baseline for detecting changes in fish sizes and abundances within and outside of no-take zones. A socio-economic study of the effects of the Central Coast MPAs was also conducted. California Department of Fish and Game is using the research to monitor the newly created Central Coast Marine Protected Areas and to help plan future MPA networks. These results should be of great benefit to state resource managers and in designing future reserves. Based on the research, resource managers should be able to predict site fidelity and home range sizes based on benthic habitat maps for the key species studied. This may allow managers to design reserves that facilitate fisheries by allowing for more catch along reserve boundaries or restricting fishing access by placing boundaries at distances greater than 100m from the rock/sand boundary. This information directly fits in the NOAA Ecosystem Research Program performance measure III (tools) by providing a means for managers to use benthic habitat maps to predict MPA size, shape, and habitat composition for the four species studied. This information will also be of interest to fishers who will now have more concrete evidence that MPAs with particular habitat types may provide good protection for certain species and that managers will now have better tools to tailor MPA design to meet particular management objectives. *[(fish ebm cli prot)]*

395 CONNECTICUT: Sea Grant Contributes to Socioeconomic Assessment and Monitoring Guidelines for Coastal Management in the Pacific

Connecticut Sea Grant contributed to the development of Pacific regional guidelines for conducting socioeconomic assessments (SEM-Pasifika), in collaboration with the Pacific Socioeconomic Monitoring Steering Committee (including Community Conservation Network, Coral Reef Initiatives for the Pacific, Foundation of the Peoples of the South Pacific International, Global Coral Reef Monitoring Network, Locally Marine Managed Areas Network, U.S. National Oceanic and Atmospheric Administration,

Secretariat of the Pacific Community, South Pacific Regional Environment Programme, University of the South Pacific, U.S. All Islands Coral Reef Committee, and WorldFish Center). The guidelines are being used by government coastal area managers, fisheries managers and non-governmental organizations to improve site management of the coastal and marine areas throughout the Pacific region. The socioeconomic information collected has improved management, monitoring, policy making, development and research. *[A/E-1 (ebm mon)]*

589 CONNECTICUT: Connecticut Sea Grant Develops a set of Socioeconomic Assessment and Monitoring Guidelines for Coastal Management in the Pacific

A socioeconomic assessment is a way to learn about the social, cultural, economic and political conditions of individuals, households, groups, communities and organizations. Socioeconomic information can be used by coastal managers for a number of purposes such as identifying threats, problems, solutions and opportunities; determining the importance, value and cultural significance of resources and their uses; assessing positive and negative impacts of management measures; assessing management effectiveness; building stakeholder participation and appropriate education and awareness programs; and verifying and documenting assumptions of socioeconomic conditions in the area, community dynamics and stakeholder perceptions. While a socioeconomic assessment is a study to collect data at one time, a socioeconomic monitoring is continuous studies to collect data over time, usually at set intervals. Socioeconomic assessments conducted at the start of a project will help understand the site and establish baseline information. Monitoring that follows the initial assessment will measure changes and help identify whether the objectives are being met. Impact: • Pacific regional guidelines SEM-Pasifika were developed in collaboration with the Pacific Socioeconomic Monitoring Steering Committee. The Committee was formed with representatives from the following organizations: * Community Conservation Network * Coral Reef Initiatives for the Pacific (CRISP) * Foundation of the Peoples of the South Pacific International (FSPI) * GCRMN (Global Coral Reef Monitoring Network) * Locally Marine Managed Areas Network (LMMA) * U.S. National Oceanic and Atmospheric Administration (NOAA) * Secretariat of the Pacific Community (SPC) * South Pacific Regional Environment Programme (SPREP) * University of the South Pacific (USP) * U.S. All Islands Coral Reef Committee * WorldFish Center • The guidelines are being used by government coastal area managers, fisheries managers and non-governmental organizations to improve site management of the coastal and marine areas throughout the Pacific region. The socioeconomic information collected has improved management, monitoring, policy making, development and research. • The guidelines have assisted interested communities in the region (including communities who have used existing methods and new communities without experiences in socio-economic assessment), management and project staff, researchers, and other practitioners, to understand important steps involved in a socioeconomic assessment and to be able to conduct the monitoring. *[(ebm mon)]*

564 DELAWARE: Coast Day Helps Public Make a Coastal Connection

Delaware Sea Grant and the UD College of Marine and Earth Studies hosted the 32nd annual Coast Day event, held to highlight the regionâ€™s coastal resources. The 2008 Coast Day theme was â€Coastal Challenges â€" Coastal Solutionsâ€ and featured interactive displays to help visitors better understand coastal challenges and their role in addressing them. Impact: Coast Day attracted 11,000 visitors. *[A/I-5 (ebm edu)]*

1074 HAWAII: UH Sea Grant Pioneers Research Crucial to Sustaining Coral Reefs

In collaboration with other researchers and funding support, we have pioneered the field of investigation into free-living Symbiodinium, the dinoflagellate genus that is crucial to sustaining coral reefs in Hawaii and elsewhere. These free-living sources of Symbiodinium may be pivotal in recovery of coral reefs that force the symbiotic populations to be replenished as reefs evolutionarily and physiologically adapt with climate changes. *[R/CR-16 (end ebm)]*

8 LAKE CHAMPLAIN: Sea Grant provides supports rain garden installation by citizens, municipalities and businesses in Vermont.

Focus Area: HEALTHY COASTAL ECOSYSTEMS NOAA SG Goal - Sound scientific information to support ecosystem-based approaches to managing the coastal environment LCSG Goal - Provide science-based information that will promote a healthy and diverse ecosystem and provide for sustainable human use and enjoyment of Lake Champlain, the basin and surrounding waters. Objective - Local residents and communities (including youth) act to protect and restore coastal, aquatic and watershed resources in the basin as a result of increased awareness of threats from NPS pollution (including phosphorus, toxins and bacteria), invasive species, and other water-related human health hazards. Sea Grant provides supports rain garden installation by citizens, municipalities and businesses in Vermont. Working with a large number of partners, LCSG assisted homeowners, municipalities, schools and businesses with the siting, design and installation of rain gardens through a number of projects, including Vermont's Rooftop to Rivers Rain Garden Contest, St Albans LID Demonstrations, and Mid-Winooski River Watershed Urban Restoration Project. The LCSG Water Quality Specialist assisted in the installation of over 40 rain gardens by over thirty homeowners, on six properties in four municipalities, at three businesses, and at four condo associations. In addition, the St Albans Roadside Rain Garden project, with the Northwest Regional Planning Commission, the City of St Albans, Vermont Youth Conservation Corp and Bishop Street Residents, led to the installation of six curb-side rain gardens by the city that eliminated local stormwater flooding problems as well as reduced storm water volume discharging to impaired surface waters. *[A/M-1 (ebm train wq wq)]*

14 LAKE CHAMPLAIN: Sea Grant finds that commonly used lamprey control treatment has significant and unexpected environmental impacts

Researchers concluded that 3-trifluoromethyl-4-nitrophenol (TFM) lampricide, used in the Lake Champlain basin for lamprey control, had significant impacts on aquatic stream macroinvertebrates. Significant changes included decreases in density in 16 of 83 benthic taxa, and changes in drifting behavior on the dates following TFM treatment. Post-treatment changes in taxa density affected the community composition of both benthic and drifting populations. A full recovery of affected organisms was not evident by the final sampling date, 33 days after TFM application. Impact: The non-target effects were not identified in the environmental assessment of the lamprey control project. Because effects of the chemical (TFM) management approach on non-target species are now more clearly evident, stakeholders are reassessing the use of non-chemical techniques to reduce sea lamprey populations with fewer impacts on the benthos. *[A/M-1 (inv wq wq ebm)]*

108 LAKE CHAMPLAIN: Sea Grant finds cormorants less affected by breeding control programs than expected

Researchers studying double crested cormorant control programs found increased rates of breeding dispersal by cormorants from colonies where population management (egg oiling) took place. The researchers also developed and tested a decision-analysis model that allows researchers and managers to evaluate various management alternatives and identify those alternatives that will meet agreed-upon cormorant population objectives for Lake Champlain, Lake Oneida, Lake Ontario, and the St. Lawrence River. Impact: A coordinated, multi-jurisdictional regional approach to cormorant management, guided by the newly developed decision-analysis model, will increase the effectiveness of cormorant control programs. *[A/M-1 (ebm)]*

732 MARYLAND: Extension faculty influence oyster management and new legislation

Work by Maryland Sea Grant Extension faculty including: an economic analysis for the programmatic environmental impact statement on the introduction of a non-native oysters, participation on the Maryland Oyster Advisory Commission as well as development of a Maryland/Virginia Shellfish Aquaculture Plan has impacted management of oyster resources in Chesapeake Bay and led to new legislation in Maryland. *[A/EX-1 (fish inv ebm)]*

29 NEW YORK: NYSG prey fish program assessment results in surveying improvements

Prey fish population trends tracked by the U.S. Geological Survey (USGS) and NYS DEC are the basis for setting stocking rates of trout and salmon to balance predator and prey abundance, an essential ingredient of healthy and sustainable recreational fisheries. In 2003, NYSG organized an independent, technical review of the Lake Ontario prey fish assessment program with prominent marine fisheries assessment scientists to evaluate prey fish sampling design, data analysis, and the validity of prey fish abundance indices. IMPACT: As revealed in a 1996 NYSG-funded study, the recreational fisheries of Lake Ontario provide an estimated economic benefit to NYS exceeding $400 million annually. And, as a result of this collaborative NYSG-led project, there is a more accurate and efficient prey fish assessment program in Lake Ontario, providing fisheries managers with enhanced ability to manage New York's world-class recreational fisheries. *[A/EEP-33 (fish mod ebm)]*

9 NORTH CAROLINA: Sea Grant results aid sparrow protection

New knowledge on habitat use by Nelson's and Saltmarsh Sharp-tailed Sparrows in North Carolina will help the National Audubon Society in efforts to identify key areas and habitats for protection. (NCSG: Ecology of Nelson's and Saltmarsh Sharp-tailed Sparrows in Southeastern North Carolina; R/MG-0624) *[MD/A-2 (ebm prot)]*

764 NORTH CAROLINA: Reviving River Herring Populations

River herring once provided recreational and commercial opportunities as well as ecological links in coastal foodwebs. However, widespread declines in stocks of river herring along the Atlantic Coast have been attributed to overfishing, decrease in water quality, and loss of habitat. These stocks have been slowly declining over the past century; however, declines in the past 30 years border on collapse. Recent surveys suggest that stocks are continuing to decline despite management efforts, stock enhancement, and measures to restore habitat for adults. Likewise, river herring are culturally and ecologically significant throughout out its range. Sea Grant research is likely to lead to long-term strategies for protecting nursery areas for estuarine dependent fishes. Also the results likely will be used for direct management by which the river herring fisheries could be restored -- fisheries so important to many coastal towns. *[R/MRD-55 (fish ebm res)]*

1422 NORTH CAROLINA: Beach Nourishment Research Results Reviewed by NC Panels

Sea Grant research results have been used by the Science Hazards Panel of the Coastal Resources Commission (CRC) to prepare draft regulations to define sediment compatibility in the rules that control permitting for beach nourishment so as to avoid future repetition of the transformation of beach habitat and loss of beach ecosystem services caused by the Bogue Banks project. In addition, the results of this Sea Grant study have been used in the legislatively mandated Coastal Habitat Protection Plan prepared to enahnce fisheries habitat in the State. *[R/CZS-32 (res ebm)]*

1426 NORTH CAROLINA: Ecosystem Effects on Erosion Control Strutures

The state of North Carolina, like many coastal states, is currently reviewing its regulations on the permitting of hard structure solutions to erosion in coastal areas. One of the factors in making these decisions is the relative ecological impacts of different structure types, which is directly addressed in this study. As an example, the NC Division of Coastal Management formed a workgroup to draft recommendations on potential ecological impacts of various erosion control measures on coastal communities. Much of the initial idea and design for this research came from discussions with the North Carolina Division of Coastal Management and its needs for making recommendations on these structures and the results of this work are being provided through the involvement of M. Posey and S. Rogers in this workgroup. *[R/MER-48 (ebm)]*

1442 NORTH CAROLINA: LIDAR Project to Provide Benefits to Coastal Managers

North Carolina Sea Grant researchers are expanding the role of LIDAR in coastal management. IMPACT: Coastal managers can expect to improve management approaches appropriate for varying conditions. For example, they will have information about the spatial variability of recent changes in beach and dune systems along the NC shoreline. And they will be be able to relate the different rates of change to specific shoreline characteristics including housing density, shoreline orientation, proximity to inlets. *[R/CZS-34 (ebm)]*

1470 NORTH CAROLINA: Trophic Transfer Research Cited in CHHP

Results from Sea Grant research were cited frequently in the description of water-column habitats in the Coastal Habitat Protection Plan (http://www.ncfisheries.net/habitat/chpp1.htm) by identifying threats to pelagic organisms from symptoms of declining water quality such as hypoxia._Broken Rungs At the Bottom of the Ladder: Effects of Estuarine Stratification on Trophic Transfer Between Plankton and Grazers; Lead PI: Peter Rand, NC State University, chris_taylor@ncsu.edu, R/MRD-47 *[R/MRD-47 (wq ebm)]*

500 OHIO: Sea Grant helps Lake Erie marinas recycle and save money

Statement: Working with an Ohio plastics company located in the Appalachian region of Ohio, Ohio Sea Grant helped coordinate the 3rd year of a boat shrink wrap and greenhouse plastic recycling effort as a "value added" project for the Ohio Clean Marina Program. Impact: Shrink wrap is now being collected from over 120 coastal marinas resulting in the recycling of over 720,000 pounds of shrink wrap and172,000 pounds of greenhouse plastic into useful products, saving individual marinas an average of $700 per year in disposal costs, and saving hundreds of cubic yards of valuable landfill space. *[(wq ebm)]*

1549 RHODE ISLAND: Shoreline development impacts herbivore control in salt marshes.

Our work has shown that local shoreline development can turn on herbivore control of marsh production and the ecological and societal services that salt marshes provide. This result has critical conservation and management implications and is being incorporated into regional and national coastal conservation and management plans. *[R/ES-061 (ebm)]*

602 WASHINGTON: Sea Grant Engages Stakeholders and Enhances Collaboration to Advance Regional Marine Research Priorities

The West Coast Sea Grant programs together solicited and analyzed over 5,000 stakeholder comments for a regional marine research and information plan. Workshops brought together diverse constituents that often found unanticipated agreement in their concerns for the marine environment. The project provided for tribal representation and leveraged regional momentum by becoming part of the West Coast Governors' Agreement on Ocean Health. A final plan is anticipated in late 2008. Impact: Partnerships with tribes, the West Coast Governors' offices and other state and federal entities will help focus common West Coast priorities and fuel efforts to address regional marine research needs. *[(ebm)]*

1613 WASHINGTON: Sea Grant provides new professional development opportunities for shoreline and coastal planners

A collaborative project of Sea Grant and the state Department of Ecology, the Shoreline and Coastal Planners Group (SCPG) fosters communication among local governments and other relevant parties, provides a forum for discussion of policy concerns, new technologies, emerging issues and changing legislation and regulations, and improves implementation of the state's Shoreline Management Act, Growth Management Act and similar programs through field trips and discussion of best practices and

lessons learned. Re-initiated after a three-year hiatus, the group has a new SCPG Web page and a 280-member list-serve. Impact: Planners at the city, county and state levels interact with each other while receiving science, policy and planning-oriented instruction from leaders and experienced professionals in their field. Improved understanding of ecosystem-oriented impacts of planning decisions will enable planners to make more robust, science-based decisions in their jobs when implementing planning and land-use regulations. All 38 participants in the inaugural meeting on urban shoreline restoration rated the meeting as useful and expressed satisfaction. *[A/E/T-CCDP-1 (train ebm)]*

1617 WASHINGTON: Sea Grant Research Assesses the Role of Ocean Conditions in the Decline of Steelhead Runs on the West Coast

Dwindling runs of anadromous steelhead (Oncorhynchus mykiss) have led to harvest reductions and job losses in recreational and tribal fisheries and related businesses. Although millions of dollars are being spent to protect and restore steelhead populations and their freshwater habitats, recent large and unpredictable fluctuations in runs may be due to changes in ocean conditions. Thus, it is difficult to assess the effectiveness of rebuilding efforts without understanding how ocean-climate processes regulate steelhead abundance. Sea Grant research created a long-term biological database (1955-2009) on steelhead in the North Pacific Ocean and mapped known ocean distributions and associated environmental conditions. Preliminary results show decadal-scale changes in the amount of critical thermal habitat for steelhead, which increased from 1960-1990 and has decreased since then. Impact: By harnessing a long-term dataset to address critical gaps in steelhead ecology, Sea Grant research is strengthening the scientific basis for management - especially critical when open ocean conditions are unfavorable for steelhead survival. *[R/F-160 (ebm mon res)]*

12 WISCONSIN: Sea Grant researchers develop species dominance index (SDI) for wetland plants

Frieswyk's 'Species Dominance Index' (SDI) remains on line as an 'Arboretum Leaflet' (http://www.botany.wisc.edu/zedler/leaflets.html), which indicates why an objective measure of plant species dominance is needed and why SDI fills that need. The species dominance index was effective in helping Zedler and West (in print, Restoration Ecology 2008) describe 30 years of salt marsh vegetation change in NOAA's Tijuana River National Estuarine Research Reserve. SDI was more useful than other measures of species richness and evenness. SDI proved useful in both freshwater and salt marsh ecosystems. *[R/LR-96 (inv ebm)]*

1683 WOODS HOLE OCEANGRAPHIC INST.: Seat Grant bridges gap between science and management

A partnership of the Woods Hole Sea Grant Program, Waquoit Bay National Estuarine Research Reserve and Massachusetts Coastal Zone Management, the Massachusetts Coastal Training Program (CTP), provides support, training and technical information to communities, organizations and agencies so they can better manage the coastal resources so vital to their economies and way of life. *[M/ (train ebm)]*

110 ALASKA: Sea Grant-NOAA research studied the ecological role of marine mammals and their response to a changing environment

Activity Summary: Alaska Sea Grant supported MAP's marine mammal specialist while collaborating on the Gulf Apex Predator-prey project, a NOAA-funded study of the seasonal and interannual variability in prey availability and use by Kodiak's apex marine predators. Results showed that the diets and distribution of Kodiak's endangered marine mammals are diverse and flexible, responding to temporal changes in environmental conditions and local prey availability. Impact Statement: Ecosystem-based marine resource management relies on understanding both the structural components of the system and the functional mechanisms of their interactions. By monitoring the seasonal distribution and abundance of predators and their prey, GAP studies have illuminated how changes in coastal climate and commercial harvests may affect endangered marine mammals and other apex predators in Alaskan waters. As a multi-year study, GAP is developing the time-series needed to explore and anticipate effects of environmental change on primary and secondary production in a coastal marine ecosystem. *[(ebm mod cli end)]*

1150 CALIFORNIA: Ecosystem-Based Management

Findings from the project were used in the California Marine Life Protection Act (MLPA) Initiative process for developing potential marine reserve designs in the Gulf of the Farallones-Cordell Bank region. The researchers formulated conservation and management recommendations to protect the marine food webs in this region. They provided distribution and abundance maps of marine birds and mammals (to show areas of high importance); they developed statistical models to understand these observed distributions and abundances in relation to krill abundance, oceanographic conditions and local physiography; and they proposed design considerations for marine protected areas in the Gulf of the Farallones-Cordell Bank region. *[R/CZ-202 (prot mon mod ebm)]*

1151 CALIFORNIA: Ecosystems-based Management for Common Thresher Shark

Fisheries resources such as thresher shark are commonly managed from the limited point of view of the domestic fishery. However, many large pelagic species have ranges that span international borders. As such, management must take in to account mortality introduced through the activities of all fisheries operating on a stock to effectively ensure sustainable harvest levels. The present study bridges this gap by providing data on the magnitude of commercial harvest of threshers in Mexican waters. In addition, the researchers describe, for the first time, the smaller-scale, but geographically extensive, artisanal fishery for threshers and other elasmobranchs along the Pacific coast of Baja California. Concurrent studies of thresher shark movement patterns are shedding light on the essential habitat used by the juvenile life-history stage of this species, and serve to identify potential threats from fisheries, as well as habitat-based management options. The primary impact of these studies, then, is that they will form the basis for an assessment of the combined effects of U.S. and Mexican fisheries on exploited elasmobranch stocks, and represent the first step towards a binational management plan. Thus, the research will contribute to the sustainability of these fisheries, and the economic welfare of U.S. and Mexican fishermen who depend upon them. Finally, the researchers believe that public education is a key element of shark conservation. Through their outreach efforts involving the Birch Aquarium, they are informing a wide public audience about shark conservation issues relevant to the Southern California Bight. *[R/OPCFISH-04 (edu ebm)]*

1168 CALIFORNIA: Improving Beach Ecosystems

Based on this research, beach management permits are now issued with the understanding that raking can be modified to reduce ecological impacts, and the City of Oceanside has changed how it adds sand to beaches to reduce impacts on beach ecology. *[R/CZ-174 (res ebm)]*

130 CONNECTICUT: Sea Grant fosters Habitat Based Management Planning among Land Stewards

Connecticut Sea Grant developed a habitat-based management plan outline as a new tool for land trust stewards and town open space managers to support the long-term conservation and management of open space in Connecticut. The outline provides a framework for the documentation of background information and a methodology to determine management actions, based on habitat, needed for the long term conservation of a particular site. More than 240 land trust and town commission members are now trained in the use of the tool and its application to the management of specific habitats. Following the training, three land trusts and one conservation commission have to date incorporated all or aspects of the outline into management plans for land parcels. The Essex (CT) land trust was awarded NRCS WHIP cost share funds to implement habitat management on one of its preserves. *[A/E-1 (ebm train)]*

131 CONNECTICUT: Sea Grant research contributes to ecosystem-based management at Milford Point, CT

Results of research supported by Connecticut Sea Grant, EPA Long Island Sound Study, Connecticut Department of Environmental Protection and others, are being combined with data management techniques and management procedures for a public outreach and volunteer base into a model for ecosystem management at Milford Point (CT), an Important Bird Area and LIS Inaugural Stewardship Area. Working with state and federal agencies, environmental organizations, and local towns, researchers are expanding a single species (horseshoe crab) data management technique to include multiple species monitoring at a single site. A centralized ecosystem management committee and single database depository for the Milford Point ecosystem will allow scientists to direct future research with a better understanding of ecological problems, facilitate improved management of citizen scientist vefforts, and enable resource managers to make management decisions informed by a comprehensive dataset. *[R/LR-20 (ebm)]*

132 CONNECTICUT: Sea grant uses regional input to identify key ecosystem-based management priorities

Sea Grant supported the activities of an 18-member Regional Ocean Science Council for the New York Bight, which conducted an online survey of more than 400 stakeholder agencies, organizations, institutions, non-profits and industry associations to identify priority issues and needs for ecosystem-based management in the region. Four key areas and two cross-cutting issues resulted, which will become the basis of a research and information plan for the New York Bight. *[R/ES-21 (ebm)]*

156 CONNECTICUT: Connecticut Sea Grant Partners Develop CT Aquatic Nuisance Species (ANS) Management Plan

Addressing aquatic plants, freshwater vertebrates and invertebrates, and marine species, the plan implements a coordinated approach to minimizing the ecological, socioeconomic and public health impacts of ANS in the State of Connecticut, and coordinates ongoing and new research, educational, monitoring, and regulatory efforts to focus on commonly-identified priorities, strategies, and tasks. Drafted jointly by CTSG, CT DEP, and the CT Institute of Water Resources, with input from numerous stakeholders, the plan was signed by the Commissioner of DEP and Governor M. Jodi Rell in March 2007. It subsequently received approval of the federal ANS Task Force in May 2007. Impact: • Connecticut now has a blueprint for management, research, and outreach that outlines priority goals, objectives and actions for a five-year period. As the plan is implemented, CT will benefit from a comprehensive and coordinated approach to address early detection and monitoring, rapid-response, control and eradication, spread prevention, and policy / legislative needs with respect to aquatic nuisance species in a timely manner. Coupled with appropriate research to address local/regional problems and educational programs targeted at a range of audiences to raise awareness of the issue, the result should be more efficient use of available resources to address priority ANS problems in CT, better coordination among involved parties, and a greater awareness of the problems ANS cause locally, nationally, and globally. • CT DEP applied for and was awarded an equal share ($43K) of the federal funds available to support the implementation of state management plans in 2008. A job description for a state invasive species coordinator with CT DEP is complete; a state hiring freeze has delayed the filling of the position. *[(ebm soc wq mon inv)]*

157 CONNECTICUT: Connecticut Sea Grant Coordinates Development of Interstate Aquatic Invasive Species Management Plan for Long Island Sound

A plan was developed to address marine invasive species in LIS on a regional basis, focusing on coordination, research, education, management, and policy. The plan was written by CT Sea Grant staff, in collaboration with two graduate students and a bi-state working group, and submitted to the New England Interstate Water Pollution Control Commission (NEIWPCC) and the EPA Long Island Sound Study (LISS) in late 2007. Adoption of the plan and establishment of a coordinating committee are two key points to be included in the 2008 Memorandum of Agreement between EPA Districts 1 & 2, and the States of Connecticut and New York; the MOA will be signed sometime in 2008. Impact: • Analyses produced for 12 marine species of concern informed an evaluation of the potential risk to Long Island Sound if they were to be successfully introduced. • Once adopted by the States, the plan and associated set of identified priorities will guide partners in the LISS to move ahead in addressing marine invasive species in this shared water body in a comprehensive, efficient manner. • Once adopted by the States, the plan will be submitted to the federal ANS Task Force for review and approval. Approval at this level will make the plan eligible for a share of federal fund available for implementation. *[(inv ebm)]*

941 CONNECTICUT: Sea Grant training leads to model for municipal shellfish management

Using GIS training provided by Connecticut Sea Grant and The University of Connecticut Geospatial Technology Program, the Town of Groton (CT) Shellfish Commission completed a project to identify and map all watersheds in the town and the associated salt water estuary receiving runoff from each watershed. The availability of this map and associated data provides the basis for calculating the contaminant load reaching each estuary and the ability to develop a specification for the maximum tolerable load. Commission members are working with Town leaders to make more informed land use decisions that have the potential to impact local shellfisheries and shellfish resources. The project was featured on Public Television and serves as a statewide model for municipal shellfisheries management. *[A/E-1 (mod ebm wq fish)]*

942 CONNECTICUT: Sea Grant GIS training facilitates identification of potential impacts to shellfish grounds

Using GIS and GPS training provided by Connecticut Sea Grant and the University of Connecticut Geospatial Technology Program, the town of Westport (CT) is conducting a shellfish resource assessment, an outfall survey and a waterfront use survey to facilitate the identification of potential impacts to shellfisheries resulting from land-based uses. *[A/E-1 (fish ebm)]*

1075 HAWAII: University of Hawaii Sea Grant Research Will Alter Management Strategies for Invasive Mangroves

Project results provide critical information to substantially alter management strategies of invasive mangroves in Hawaii. Specifically, results indicate that mangrove removal should include extrication of below-sediment roots and fiber mats to allow rapid restoration of normal ecosystem structure and function. Otherwise, mangroves may continue to impair ecosystem functions in the Hawaii coastal zone for at least six years. *[R/CR-17 (inv ebm res)]*

108 LAKE CHAMPLAIN: Sea Grant finds cormorants less affected by breeding control programs than expected

Researchers studying double crested cormorant control programs found increased rates of breeding dispersal by cormorants from colonies where population management (egg oiling) took place. The researchers also developed and tested a decision-analysis model that allows researchers and managers to evaluate various management alternatives and identify those alternatives that will meet agreed-upon cormorant population objectives for Lake Champlain, Lake Oneida, Lake Ontario, and the St. Lawrence River. Impact: A coordinated, multi-jurisdictional regional approach to cormorant management, guided by the newly developed decision-analysis model, will increase the effectiveness of cormorant control programs. *[A/M-1 (ebm)]*

133 LAKE CHAMPLAIN: Sea Grant engages retailers to reduce residential use of phosphorous fertilizer

Focus Area: HEALTHY COASTAL ECOSYSTEMS NOAA SG Goal - Widespread use of ecosystem-based approaches to managing land, water and living resources in coastal areas LCSG Goal - Ecosystem-based approaches used to promote a healthy and diverse ecosystem and provide for sustainable human use and enjoyment of Lake Champlain, the basin and surrounding waters. Objective - Decision-makers, planners, and managers apply knowledge of basin ecosystem processes to reduce the effects of environmental stressors and long-term human and ecosystem health. Sea Grant engages retailers to reduce residential use of phosphorous fertilizer. In 2003 organizations in Vermont and New York interested in protecting the health of Lake Champlain joined to form the Green Lawn Coalition. Lake Champlain Sea Grant was a founding member. The group education activity has focused on educating retailers to a) increase the availability of no-phosphorous lawn care alternatives and b) to involve them in point of sale education of consumers about no phosphorus fertilizer. An assessment of the education effort showed three important changes. Fertilizer tonnage reports show amounts of non-farm phosphate-containing fertilizer brought into Vermont for sale to consumers nearly halved, dropped by nearly half, from 294.25 tons in 2003 to 161.2 tons in 2007 (2008 data were not available). The number of phosphorous free lawn care products registered for sale in the state increased dramatically. Although registration data only show that a product was intended for sale in the state, such data are a good proxy for consumer demand for a product. There were 80 phosphorous free lawn care products registered in 2003, at the start of the education effort. The number grew to 145 in 2006 and nearly tripled to 221 in 2008. The number of retailers also grew, from less than ten before 2003 to 41 in 2008 - 29 in Vermont and 12 in the New York portion of the basin. *[A/M-1 (ebm res wq wq)]*

134 LAKE CHAMPLAIN: Sea Grant helps towns and school districts eliminate phosphorous fertilizer use

Focus Area: HEALTHY COASTAL ECOSYSTEMS NOAA SG Goal -Widespread use of ecosystem-based approaches to managing land, water and living resources in coastal areas LCSG Goal - Ecosystem-based approaches used to promote a healthy and diverse ecosystem and provide for sustainable human use and enjoyment of Lake Champlain, the basin and surrounding waters. Objective - Decision-makers, planners, and managers apply knowledge of basin ecosystem processes to reduce the effects of environmental stressors and long-term human and ecosystem health. Sea Grant helps towns and school districts eliminate phosphorous fertilizer use. Fertilizer containing phosphate is used by towns and school districts in Chittenden County, VT, as part of routine grounds in care in parks, public areas and school grounds. , Lake Champlain Sea Grant and the VT Agency for Natural Resources teamed to develop an education program in 2008 to inform school district and municipal grounds care supervisors about the impacts of phosphorous use on local and lake water quality, and the environmental and educational benefits of adopting phosphorous free grounds care on these highly visible public properties. By fall 2008, four of the 7 school districts that were using phosphate-containing fertilizer changed to low input, no phosphorous grounds care practices. Two of the five municipalities that reported using phosphorous-containing fertilizer both began trials in 2008 to evaluate cost, effectiveness and ease of use of phosphorous free fertilizer. *[A/M-1 (ebm wq)]*

135 MAINE: Partners clean up Ogunquit beaches

High bacteria levels on Ogunquit Beach prompted the Maine Healthy Beaches Program to conduct a multi-year special study of the Ogunquit River and Ogunquit Beach watershed. In 2008, program staff (in partnership with the Maine Geological Survey) presented the study findings and recommendations based on a coastal current survey, additional monitoring, and GIS HOT-SPOT analysis to state and town representatives and local residents. As a result, the town of Ogunquit inspected 53 subsurface disposal systems, initiated a stormwater mapping project, and the Ogunquit Conservation Commission passed a new ordinance titled: An Ordinance to Amend the Ogunquit Zoning Ordinance (Title X) to Protect Additional Streams Beyond Those Required by Department of Environmental Protection Minimum Shoreland Zoning Guidelines. Additionally, the towns of Wells and Ogunquit committed $8,000 to support implementation of the Ogunquit River Management Plan (in partnership with the Wells National Estuarine Research Reserve). *[A/08-01 (wq wq wq ebm prot)]*

948 MAINE: Advancing community-based management of coastal ecosystems

Several partners have cited Sea Grant's participation as a vital component to the Taunton Bay Pilot Project, the only continuous ecosystem-based coastal resource management initiative in the nation that is led by a community, not an agency. Taunton Bay has served as a test site for new fisheries management approaches, such as Area Management, Limited Access Privileges Programs (LAPPs), Quota Management, and Collaborative Stock Assessments, which are being discussed by industry groups and may be applied to future management of Maine's scallop, urchin, and groundfish resources. *[A/EXT-03-03 (ebm fish)]*

1326 MAINE: Sea Grant builds capacity for ecosystem-based management

New England’s first ecosystem and community-based inshore marine management pilot project was endorsed by the Maine Legislature and the Department of Marine Resources in April 2007, following an executive order by Maine Governor John Baldacci that created the Taunton Bay Management Area and management protocols for four commercial fisheries (mussel, scallop, urchin and kelp). The legislature approved a change in statutes allowing management decisions made by a local advisory group of local conservationists, scientists, and users of the bay’s commercial resources to be implemented relatively quickly by the DMR through their regulatory process. The Marine Resources Committee of the Maine Legislature selected Sea Grant as a neutral “convener” to provide oversight of the new process. The State of Maine hopes to use this community-based ecosystem management model at other sites along the coast. *[A/EXT-06 (ebm)]*

1342 MARYLAND: Inform food web models for improved ecosystem-based fisheries management

Results of the three-year project are being incorporated in food web models under development by the NOAA Chesapeake Bay Office (the Chesapeake EcoPath model) and with funding from the EPA Chesapeake Bay Program (Chesapeake TroSim). The goal of both of these modeling efforts is to provide tools that will facilitate a shift toward ecosystem-based fisheries management in Chesapeake Bay, and to predict food web effects of declining and restored oyster populations. *[R/P-54 (mod ebm res)]*

506 NEW HAMPSHIRE: Coastal Communities Utilize Information

Three NH Coastal Communities developed plans to conserve open space and natural resources utilizing information provided by Sea Grant staff. *[A/P-32 (ebm)]*

507 NEW HAMPSHIRE: Communities Protect Natural Resources

3 NH Coastal Communities developed plans to protect key natural resources and open space with information provided by NHSG staff. *[A/P-2 (ebm)]*

1393 NEW HAMPSHIRE: Sea Grant advances understanding of communications networks

Sea Grant-supported researchers at the University of New Hampshire and the Virginia Institute of Marine Science how different marine-related individuals and organizations share information. Impact: Regulatory groups in the U.S. and Canada are using the findings to improve their regulatory efforts. *[R/MED-10 (ebm)]*

149 NEW YORK: Sea Grant workshop helps stakeholders understand Lake Ontario lower food web indicators

NYSG compiled information for using lower food web indicators to gauge Lake Ontario ecosystem health and sustainability. At a one-day workshop where top U.S. and Canadian scientists presented this information to the public, 50 attendees learned the effects of nutrient regulation on zooplankton, phytoplankton and fish communities, and how lower food web organisms may indicate ecosystem sustainability. Participants evaluated the workshop highly successful and the Ontario Ministry of Natural Resources (OMNR) requested NYSG develop a companion workshop for Canadian stakeholders in 2009. OMNR also recommended that this workshop template be adapted by the Lake Ontario Committee to present to the NY-Ontario public as part of the revision of Fish Community Objectives for Lake Ontario. NYSG information will be used as the Great Lakes Fisheries Commission develops a 'traffic-light'? model to help stakeholders understand the links between ecosystem sustainability and the status of food web indicators. The model assigns a red color to indicators of serious ecosystem stress, yellow to indicators of moderate stress, and green to food web indicators of a healthy ecosystem. *[A/EEP-33 (ebm wq fish train)]*

1418 NEW YORK: Sea Grant squid research reinforces development of a multi-species fisheries management approach

Sea Grant researchers have evaluated the ecological effects of cephalopod fisheries, showing that squid play an important role in the food web of the Atlantic continental shelf depending on their stage of life--sometimes the predator, sometimes the prey. Impact: This multi-life stage, multi-species approach has stimulated discussion among fisheries managers and researchers and served as reference for discussions

leading to the reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act. *[R/FBM-27 (ebm)]*

146 NORTH CAROLINA: Students Receive Hands-On Estuarine Education

In spring 2008 and spring 2009, North Carolina Sea Grant researchers took, in total, 840 eighth graders and their teachers out on the Neuse Estuary aboard our research ship, the RV Humphries. The students received hands-on education about water quality assessment and also were given handouts and other instruction about how land-use changes in the watershed influence estuarine water quality. The feedback from the students and teachers has been highly favorable, and pre-/post-evaluation scores indicate that this educational experience significantly increased students' knowledge about the Neuse ecosystem and the strong relationship between land use changes and receiving water quality. *[R/UC-1 (edu edu wq ebm)]*

1088 NORTH CAROLINA: Oyster Broodstock Reserve Locations Identified; NOAA Recovery Act project uses NCSG results

A key issue regarding the application of networks of reserves for fisheries and ecosystem-based management is justification for where to locate reserves and at what sizes. The results from Sea Grant research provided initial scientific justification for determining the location of oyster broodstock reserves in Pamlico Sound, NC, based on potential larval dispersal. Additionally, this research has identified potential variation in the timing and strength of larval connectivity among broodstock reserves, which supports application of the concept of metapopulation dynamics and modeling to further refine where and what size to locate and build oyster reserves in Pamlico Sound, including a new reef that is being funded by the 2009 NOAA Recovery Act. The N.C. Coastal Federation, working closely with the N.C. Division of Marine Fisheries, scientists and other private industry partners, received a $5 million grant to put private industry to work rebuilding the state's oyster reefs. The project will save or create 140 jobs, many of them in industries hard-hit by the economic downturn, such as commercial fishermen, quarry workers, tug boat and barge operators and fisheries technicians. *[R/MRD-53 (fish ebm)]*

214 OREGON: The Gravel Extraction Industry and Fish Habitat Interests Work Together

In-stream aggregate mining (the removal of material from a streambed) has direct impacts on the channel's physical boundaries, on the ability of the stream to transport and process sediment, and on numerous related aquatic habitat characteristics. Effects can include changes in channel geometry, reduced streambed elevation, changes in substrate composition, loss of in-stream roughness elements, decreased average stream depths, and changes in water velocity patterns. Unfortunately, there is a lack of consensus among various regulatory agencies, mining operators, and other stakeholders as to what constitutes best management practices for in-stream aggregate mining operations. Several stakeholders asked Oregon Sea Grant (OSG) to review this situation and offer guidance. In response, OSG and several partners brought together nearly 90 researchers, scientists, engineers, hydrologists, agency representatives, gravel operation managers, and appropriate stakeholders to discuss gravel-mining impacts on fisheries and water quality, existing regulations, and operations. The roundtable, workshop-style format allowed the attendees to work together and propose alternative operation methods that

minimize ecosystem impacts, identify potential research questions and projects, and offer alternative appropriate regulations for the industry. As a result, follow-up meetings and focus groups continued, with a decision made to center efforts on the Chetco River and continue working together to finalize the research plan and next steps. Since then, the group has progressed, meeting with USGS representatives and planning the next step of completing a pilot project designed to provide an example of a mechanism (template) to use for related industry operations in other watershed systems. *[(ebm unk)]*

1479 OREGON: Master Watershed Program Moves Beyond Oregon Borders

Oregon Sea Grant's Master Watershed Steward (MWS) program has been delivered to watershed groups and citizens interested in watershed enhancement for the past seven years. Many impacts have been recorded in relation to people conducting field projects: Teachers apply their watershed steward training in their classrooms where class projects improve their community watersheds; local government, citizen groups, and business leaders apply stewardship training in on-the-ground stream and wetland projects. Several report they have applied for and received grant funding to enhance their projects. Surveys were sent to states who purchased an MWS Learning Guides or requested information on how we organize and deliver our program. Seventeen surveys were completed from ten different states and Mexico; eleven indicated they have used the materials and have delivered some type of watershed related program. Three states have active watershed stewards programs based on Oregon materials and experiences: Arizona, North Carolina and Texas which are multiplying the efforts of success. *[A/ESG-7 (edu edu train ebm wq)]*

601 RHODE ISLAND: Rhode Island Special Area Management Plans implement ecosystem-based management.

Rhode Island Sea Grant has a 25 year history of working with the RI Coastal Resources Management Council in development and implementation of Special Area Management Plans (SAMPs). Tailored to economic, ecological and social place-based conditions in partnership with local towns, community groups, and industry/businesses, SAMPs define the baseline ecohistories and carrying capacity of the area then layout guidance and regulations that lead towards sustainable coastal economies, ecology, and communities. Due to Sea Grant work Rhode Island now has SAMPs for suburban and urban coasts, island ecosystems, interstate coastal ecosystems, and soon for open ocean/offshore ecosystems. While current press is touting ocean zoning as the latest and greatest, Rhode Island has been doing this for over 25 years using SAMPs. *[(ebm)]*

1500 RHODE ISLAND: Application of landscape ecology to social science marine issues in Narragansett Bay.

In our study, we applied analytical techniques commonly used in spatial statistics and landscape ecology to describe and quantify spatial patterns of vessel activity in coastal waters of the Narragansett Bay. Our results indicate that Recreational boating in the upper Bay tends to occur more frequently and cover more area than Commercial and Industrial activities. Understanding the spatial structure of human activities can shed light on possible effects of humans on the marine environment and forecast

possible impacts of policies or use changes (e.g., new marinas) on humans. Our results also show that Recreational, Commercial, and Industrial activities in the upper Bay take place in areas with certain environmental characteristics (e.g., Recreational activities tend to occur in open water habitat and in deeper waters; they are less likely to occur near beaches or salt marshes. Commercial activities tend to occur in deeper water.) Understanding this overlap in cultural and physical features can contribute to our knowledge of complex environmental systems where numerous social and ecological variables interact. Also, we found that observed activities in the upper Bay generally correspond with similar state designated zones for water use (e.g., industrial activity was observed in the industrial waterfront zone). *[R/SS-062 (ebm)]*

1508 RHODE ISLAND: First Science Summary for Narragansett Bay in 20 years published

In early 2008 Rhode Island Sea Grant delivered the first science summary of Narragansett Bay (Kremer & Nixon, 1973), and the first comprehensive description of the bay in book form (Hale, 1983), in 20 years. This publication, as described earlier in this report, has been incorporated into the management and decision-making framework for various Rhode Island agencies. It has also sparked the Narragansett Bay Estuaries Program to initiate an “update symposium” that will focus on new science results for Narragansett Bay, and is serving as a model for the development of a similar volume for Long Island Sound (Yarish et al., in preparation). *[E/G-061 (ebm edu)]*

1511 RHODE ISLAND: Improvements to NOAA CMECS Version 3 protocols.

The paper that we recently submitted to Ecological Applications proposes a major improvement to the NOAA national habitat classification protocol (CMECS version 3). The proposed approach will make the protocol much more useful for ecosystem-based management approaches. *[R/ES-063 (ebm)]*

1519 RHODE ISLAND: New tool for circulation dynamics of Narragansett Bay.

The primary impact has been the development of an important new tool for understanding circulation, transport, flushing, etc of the Narragansett Bay ecosystem. Coupled with this is the collection of 8 months worth of circulation and hydrography data during two different years with 4 ADCP stations and collection of spatially detailed underway ADCP data in the mid-Bay region. This is the most comprehensive physical data set that exists for the Bay. The combination of the calibrated ROMS model with these new observational data sets provide the framework for using ROMS as a management tool for local managers. The ROMS model developed on this project represents an ecosystem management tool. ROMS itself is a technology which has been developed and applied to our local estuary. However, the combination of modeling/data collection activities on this award has lead to technical advances in terms of designing observational networks for capturing the temporal-spatial variability in systems with complex geometries, like Narragansett Bay. Modeling results highlight how inadequate conventional technologies are at capturing circulation features recorded in the ROMS Bay models. Pathlines for modeled passive floats moving in the flow fields reveal the formation of gyres which limit water exchange from systems like Greenwich Bay. Underway surveys cannot resolve these features. Moored arrays could completely miss gyre boundaries and the drift of gyre boundaries. This

work has led to a collaboration between URI and a local business Bluewater Designworks to develop a new class of shallow water floats. *[R/P-061 (mon mod ebm)]*

1588 WASHINGTON: Sea Grant Develops New Ecosystem Model to Manage California Current Fisheries

Many West Coast fisheries, their resources, and the port communities they support have collapsed in recent decades. Sea Grant research has developed a bioeconomic model for the California Current ecosystem – one that quantifies resilience and tradeoffs among marine ecology, regional economics, and climate interactions within the ecosystem. Impact: The Pacific Fishery Management Council (PFMC) is using the model in its management process to address development of marine protected areas, fleet capacity reductions, rebuilding of overfished groundfish and salmon stocks, and the relationship between sustainable fishing communities and the coastal marine ecosystem. The model allows managers to better account for dynamic linkages among the ecosystem, socio-economics, and management of the fishery, as well as ecological complexity and spatial variability. *[R/F-145 (prot ebm cli mod)]*

1622 WASHINGTON: Sea Grant research develops new ecosystem model to manage California Current fisheries

As the Pacific Fisheries Management Council entertains new regulatory options for the U.S. West Coast groundfish fishery, there is a window of opportunity to communicate findings about spatial patterns in West Coast fisheries. Sea Grant research has developed a model to manage California Current fisheries that will provide timely insight about spatial tradeoffs and ecological interactions from an interdisciplinary perspective. Impact: Through this modeling work, the Council can better address the grand question: How do linkages between the ecosystem, socio-economics and management of the fishery differ when accounting for ecological complexity or spatial variability? *[R/F-145 (ebm mod)]*

1649 WASHINGTON: Sea Grant Works with Regional and International Fisheries to Reduce Seabird Deaths

Sea Grant is continuing work with fishermen and federal managers to curb accidental capture of endangered short-tailed albatross and other seabirds in commercial fishing operations. Based on Sea Grant recommendations, the North Pacific Fishery Management Council amended Alaskan seabird avoidance measures for small longline vessels and for longline vessels fishing in inside waters, affecting over 600 Alaska longline vessels. Managers have also recognized the value of seabird distribution data to ecosystem-based fisheries management and adopted Sea Grant protocols on NOAA Fisheries cruises to assess West Coast groundfish and all Alaska stocks. Impact: Sea Grant research and outreach have led to adoption of science-based seabird bycatch mitigation strategies in Alaskan longline commercial fisheries and to research on mitigation techniques in fisheries worldwide. Techniques derived from this project could save at least 80,000 seabirds over the next 10 years in Alaskan waters alone. No endangered short-tailed albatross deaths have been observed in Alaska fisheries since 1998. *[A/FP-6 (end ebm)]*

140 WISCONSIN: Food Web Model of Green Bay Shows Potential Impacts of Invasive Species

Sea Grant-funded researchers at Lawrence University and the University of Wisconsin-Green Bay constructed a mass-balance model of the Green Bay food web using the EcoPath/EcoSim modeling package. Utilizing the unified database of the Green Bay food web, researchers examined the potential impacts of recent invasions on the food web. IMPACT: The model provides fisheries researchers and managers with a predictive tool and an integrated method for comparing the impacts of invasive species in Green Bay with changes in other Great Lakes ecosystems. *[R/LR-93 (inv ebm mod)]*

143 WISCONSIN: Sea Grant project creates food web model of Green Bay

Sea Grant researchers De Stasio and Reed constructed a mass-balance model of the Green Bay food web using the EcoPath/EcoSim modeling package. Utilizing the unified database of the Green Bay food web, the researchers have examined the potential impacts of recent invasions on the food web. Impact: The model provides researchers with an integrated method for comparing impacts of invasive species in Green Bay with changes in other Great Lakes ecosystems. *[R/LR-93 (inv ebm)]*

260 HAWAII: Hawaii Sea Grant Supports Dune Restoration Efforts on Maui

Coastal dunes at Kamaole III Park in Kihei, Maui, have long suffered from degradation due to grading, foot traffic, and lack of vegetative ground cover. Zoe Norcross-Nu'u, a Hawaii Sea Grant Coastal Processes Extension Agent based in Maui, worked with the Maui Parks Department and a community non-profit volunteer group, Hoaloha Aina, to design, obtain funding for and implement a dune restoration project at the park. The project, which was begun in 2005, is experiencing great success. The second phase of the project is now underway and will involve dune enhancement with sand dredged from the Kihei Boat Ramp beginning September 17, 2007. Sand placement will be followed by planting with native coastal plants, sand fencing for temporary dune protection and post-and-rail fencing for long-term dune protections, as well as wooden beach access stairways to prevent erosion at high-use areas. Impact: The project has been educational to the Kihei community for residents and visitors alike. The project was the recipient of the National Association of County Parks and Recreation Officials Award in the Environmental/Conservation category, awarded on July 16, 2007 in Richmond, Virginia. This award was recognized by the Maui County Council on August 21, 2007, with the adoption of Resolution No. 07-98, "Congratulating the Kamaole III Beach Park Sand Dune Restoration Project for Winning the 2007 National Association of County Parks and Recreation Officials Award in the Environmental/Conservation Category," in which Norcross was recognized as a contributor. *[(ebm res prot)]*

1075 HAWAII: University of Hawaii Sea Grant Research Will Alter Management Strategies for Invasive Mangroves

Project results provide critical information to substantially alter management strategies of invasive mangroves in Hawaii. Specifically, results indicate that mangrove removal should include extrication of below-sediment roots and fiber mats to allow rapid restoration of normal ecosystem structure and function. Otherwise, mangroves may continue to impair ecosystem functions in the Hawaii coastal zone for at least six years. *[R/CR-17 (inv ebm res)]*

227 MAINE: York takes action to protect water quality

The town of York's sandy beaches are an integral part of the local economy, yet several beaches periodically experience high bacteria levels, forcing swim advisories. Town officials, working with the Maine Healthy Beaches program, created a new position for a Shoreland Resource Officer. This new position has allowed the town to be proactive by expanding its water quality program beyond the shoreline to include the upstream watersheds. In addition, with help from the U.S. EPA, beach monitors collected and analyzed additional water samples to identify the source of pollution in the Cape Neddick River. When these results were presented to the town by the beach manager and the Shoreland Resource Officer, the York Selectmen unanimously voted to track down and remediate land-based sources of pollution. *[A/08-01 (wq wq mon ebm)]*

267 MICHIGAN: Helping Communities Effectively Reduce Stormwater Runoff

A Sea Grant-supported research team has developed tools that allow coastal communities to compare runoff-reduction strategies and to identify the places where new stormwater structures can have the most impact. In collaboration with municipal officials from Spring Lake watershed, researchers have developed a model of how suspended solids, phosphorus, and nitrogen move through the watershed. Using these models, they have evaluated the effectiveness and the cost of a wide range of stormwater management options, including vegetated buffers, rain gardens, and porous pavement. In addition, the investigators prepared a comparison of ordinances that municipalities could adopt to reduce runoff from developed areas. *[(mod ebm wq wq wq res)]*

1386 MISSISSIPPI/ALABAMA: Sea Grant researchers assess estuarine populations to provide managers with decision making information.

Knowledge of status and trends in abundance of commercially exploited species is a key component of management. Management agencies usually operate with limited state funding to collect, analyze, and interpret data. The current project provided the opportunity to use advanced statistical techniques to analyze archived fisheries data for the states of Mississippi and Alabama. This work is a starting point toward understanding the incremental impacts of human population growth and industrial development on fisheries productivity and the development of strategic plans for mitigation of causative factors. Impact: The Mississippi Department of Marine Resources (MDMR), the Alabama Department of Conservation and Natural Resources, Marine Resources Division, the Mobile Bay National Estuary Program and the Gulf State Marine Fisheries Commission Blue Crab Subcommittee and Technical Coordinating committee has reviewed and interpreted this data. Managers can use this model to discern causes for declining population trends. Based on the findings of this study, the MDMR formed a committee to update sampling protocols and initiated a comprehensive program to address monitoring issues and other state agency managers have the tools needed to make informed decisions and take the necessary action to better manage a changing habitat. *[R/SP-16 (ebm mod mon)]*

233 NORTH CAROLINA: Tools to Identify Nitrogen Role in Estuaries

Two products are expected from North Carolina Sea Grant research regarding nitrogen in the estuaries. First, The N removal maps for the CFRE and NRE will indicate the presence of N removal hot spots in the estuaries. Second, by optimizing Q-PCR protocols of hzoAB genes, a lower cost and fast screening tool will be designed to predict the contribution of anammox in N capacities in various aquatic ecosystems. The researchers also expect to complete/refine N removal capabilities of the two estuaries based on anammox and denitrification. This knowledge will permit better estimation of ecosystem N residence time hence providing estuary-specific timescales for water quality improvements following N loading reductions. Additional end-users include city and/or town planners located along these estuaries. Identification of N removal hot-spots can be considered when determining locations and sizes of future wastewater inputs. *[R/MER-57 (mon mod eq ebm)]*

262 NORTH CAROLINA:

North Carolina Sea Grant researchers determined the relative ecological impacts of different types of erosion-control structure types -- results shared with the N.C. Division of Coastal Management (DCM) and N.C. Coastal Resources Commission, which are expected to set regulations for such structures. The Sea Grant researcher and staff erosion control specialist have served on a state workgroup to develop recommendations on erosion-control structures. The research results also were part of a conference hosted by DCM, N.C. Division of Marine Fisheries and NOAA's Beaufort Lab to explore the topic with managers, scientists, elected officials and citizens. (NCSG: Effects of Erosion Control Structures on Adjacent Benthic and Nektonic Communities, R/MER-48) *[(ebm mon)]*

945 NORTH CAROLINA: Placement of New Oyster Reefs in Pamlico Sound, NC

A key issue regarding the application of networks of reserves for fisheries and ecosystem-based management is justification for where to locate reserves and at what sizes. North Carolina Sea Grant research has provided scientific justification for determining the location of oyster broodstock reserves in Pamlico Sound, NC, as well as the size of reserves necessary to ensure that the network persists over time. Additionally, this research has demonstrated that oyster densities in reserves have increased 432% in three years, with an average of about 1500 oysters/m2, and that growth and survival rates of oysters are high relative to other studies in US estuaries. The results from this study provide solid evidence of the positive response of the oyster population in Pamlico Sound to restoration efforts using mounds of rip-rap placed in no-take broodstock reserves. *[R/MRD-56 (ebm prot fish res)]*

214 OREGON: The Gravel Extraction Industry and Fish Habitat Interests Work Together

In-stream aggregate mining (the removal of material from a streambed) has direct impacts on the channel's physical boundaries, on the ability of the stream to transport and process sediment, and on numerous related aquatic habitat characteristics. Effects can include changes in channel geometry, reduced streambed elevation, changes in substrate composition, loss of in-stream roughness elements, decreased average stream depths, and changes in water velocity patterns. Unfortunately, there is a lack of consensus among various regulatory agencies, mining operators, and other stakeholders as to what constitutes best management practices for in-stream aggregate mining operations. Several stakeholders asked Oregon Sea Grant (OSG) to review this situation and offer guidance. In response, OSG and several partners brought together nearly 90 researchers, scientists, engineers, hydrologists, agency representatives, gravel operation managers, and appropriate stakeholders to discuss gravel-mining impacts on fisheries and water quality, existing regulations, and operations. The roundtable, workshop-style format allowed the attendees to work together and propose alternative operation methods that minimize ecosystem impacts, identify potential research questions and projects, and offer alternative appropriate regulations for the industry. As a result, follow-up meetings and focus groups continued, with a decision made to center efforts on the Chetco River and continue working together to finalize the research plan and next steps. Since then, the group has progressed, meeting with USGS representatives and planning the next step of completing a pilot project designed to provide an example of a mechanism (template) to use for related industry operations in other watershed systems. *[(ebm unk)]*

264 OREGON: Fish Habitat Restoration Prioritization Protocols Taking Hold

Many watershed councils and management agencies previously lacked coherent fish habitat restoration plans and failed to prioritize restoration projects based on clear and logical rules, resulting in some publicly-funded projects making little difference in fish habitat availability or quality. This led Guillermo Giannico, Oregon Sea Grant's (OSG) fisheries extension specialist, to take the lead in developing a prioritization of restoration actions protocol. He worked with several partners to organize and develop workshops and seminars on the prioritization methods applicable to restoration work and he produced manuscripts and peer-reviewed publications on the subject (for example, Beechie, T., G. Pess, P. Roni, and G.R. Giannico. 2008. Setting river restoration priorities: a review of approaches and a three-step process for identifying and prioritizing actions. North American Journal of Fisheries Management 28:891–905). This topic has continued to attract the interest and attention of an increasing number of groups as they attend and participate in OSG demonstration projects, training workshops, and presentations around the state. Giannico has accepted several invitations to present on this topic, including two from the University of British Columbia, Canada, and his abstract for an oral presentation was accepted at the 4th International Conference on River Restoration (June 16–21, 2008, Venice, Italy). After Giannico trained the Luckiamute Watershed Council in this prioritization protocol, the council used it as the template for developing its own Action Plan. North coast partners indicated a heightened interest in the prioritization protocol from other northern coastal watershed councils, and several watershed council coordinators requested that OSG begin planning for a regional workshop, involving NOAA staff, on stream assessment, restoration prioritization, and monitoring, to be delivered in late 2009. *[(fish res ebm train)]*

481 PENNSYLVANIA: Helping Landowners Preserve Environmentally Sensitive Land

PASG assisted the Lake Erie Region Conservancy and municipalities to secure funding to carry out simple acquisition and conservation easements to preserve open space and protect environmentally sensitive areas in the Pennsylvania Lake Erie drainage basin. Highlights include efforts to: 1) acquire 85.1 acres connecting the Seaway Trail with Game Land 314 in Springfield Township; 2) acquire a 46.6-acre access easement along Elk Creek in Fairview Township; and 3) acquire a conservation easement on 16.3 acres along the Lake Erie bluffs in Harborcreek Township. *[(ebm)]*

1595 WASHINGTON: Sea Grant encourages ecosystem approach to native oyster restoration

The Olympia oyster (Ostrea conchaphila) suffered major declines in the Pacific Northwest due to overexploitation and pulp mill pollution and has largely failed to recover despite the removal of these stressors. Predation by the invasive Japanese oyster drill (Ocinebrina inornata) is one factor potentially keeping Olympia oysters locally scarce. Sea Grant-supported research has developed predator-prey models to identify biological characteristics of sites where invasive drills pose a high risk to native oysters. Impact: State agencies and nongovernmental organizations can use these models to develop mitigation strategies and to forecast where restoration efforts are likely to fail due to introduced predators. Ongoing native oyster restoration projects by The Nature Conservancy and Puget Sound Restoration Fund are specifically addressing potential risk from oyster drills. *[R/ES-62 (res mod ebm)]*